

# RF Exposure

## 1. IBM ThinkPad 802.11b Wireless LAN Mini-PCI Adapter

The applying equipment is a compact laptop computer which is categorized as a mobile device by FCC CFR 47 Section 2.1091. Therefore the separation distance between the antenna and the human body is 20cm or more. As shown in the following photo, the applying equipment satisfies the requirement of antenna separation.

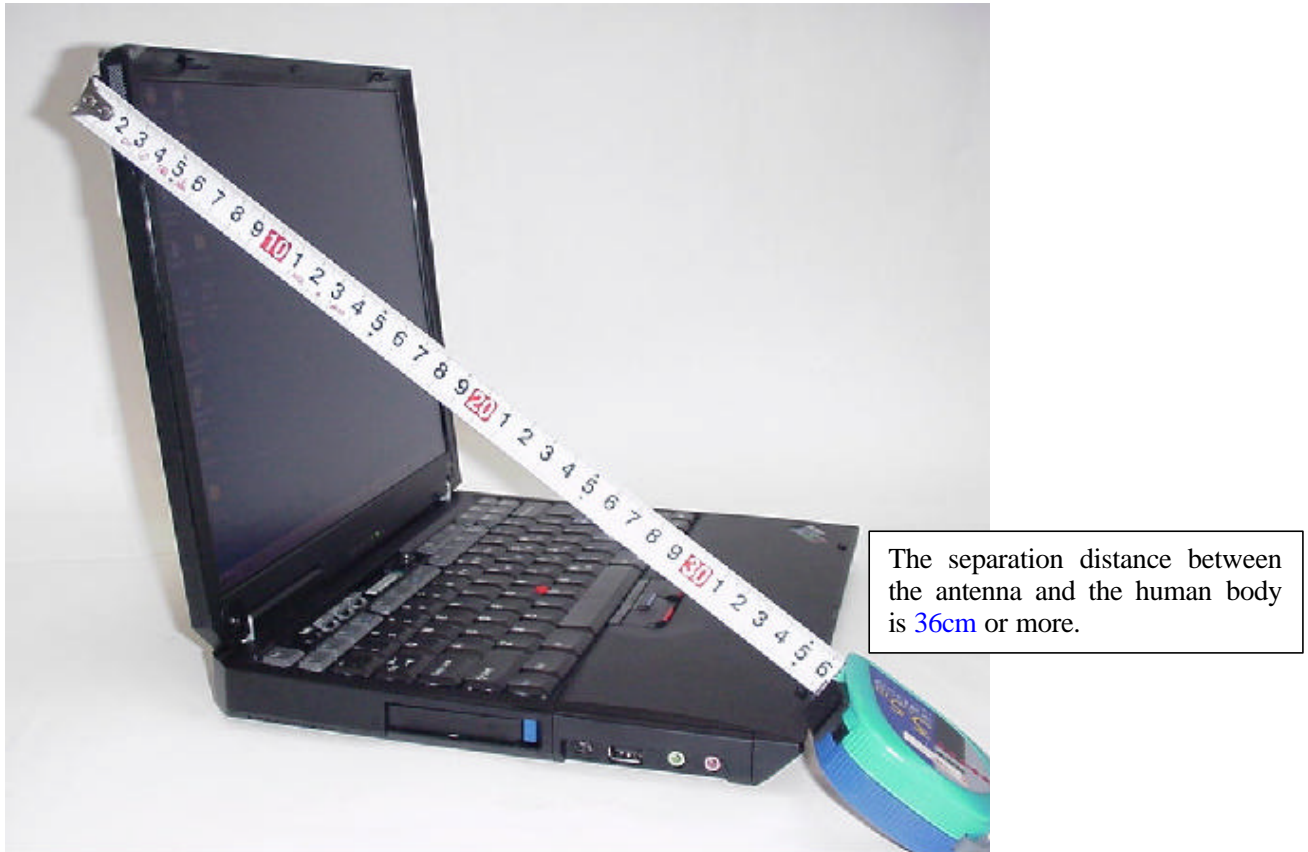


Figure 1. Integrated antenna separation from human body

The peak conducted output power of the applying equipment is 14.3dBm, and the maximum antenna gain is -0.11dBi (Dipole antenna of 13" inch model) or -1.58 dBi (Inverted F antenna of 14" inch model) as shown in Figure 2.

Therefore the maximum peak radiated output power (EIRP) is calculated as follows.

$$\text{EIRP} = P + G = 14.3 \text{ dBm} - 0.11 \text{ dBi} = 14.19 \text{ dBm} (26.24 \text{ mW})$$

Then, the maximum power density at 20cm distance is determined as follows.

$$S_1 = \text{EIRP} / (4 \times R^2 \times \pi) = 0.0053 \text{ mW/cm}^2$$

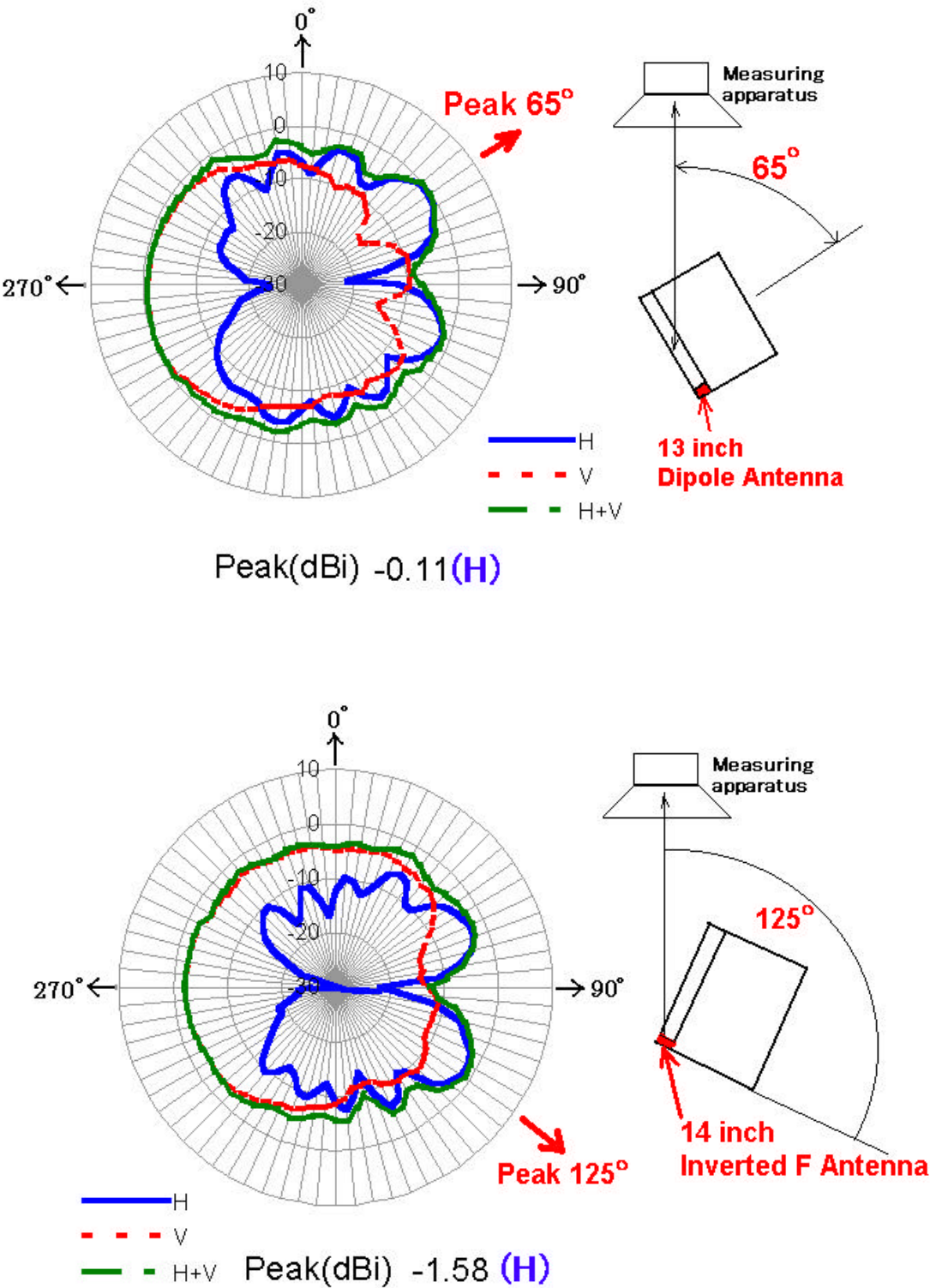


Figure 2. Transmitter Antenna Gain and Radiation Pattern

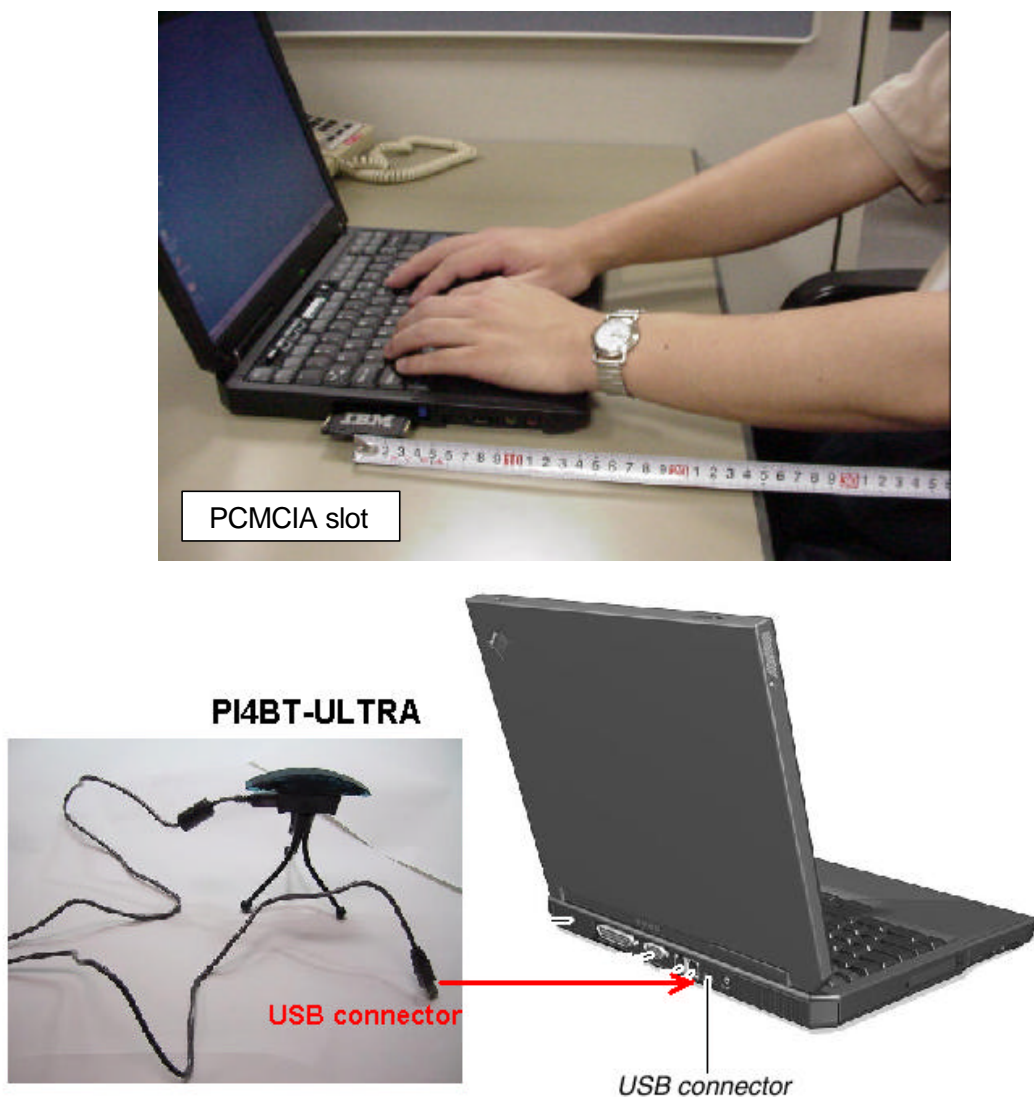
## 2. User option PCMCIA Wireless cards

The applying equipment has two interfaces to connect user's option wireless cards. The following wireless options are used in the PC slot or USB port of the equipment.

FCC ID	Grantee Name	Product Name	Granted Date	EIRP in FCC test report
PI4BT-ULTRA	TDK Systems Europe Ltd.	Bluetooth Ultraport Module	May/22/2001	1.4 mW
O2OBTPCM101	Degianswer A/S	Motorola Bluetooth 0dBm PC-Card (type no.: BTPCM100)	October/18/2000	2.7mW

Figure 3 shows the locations of each interfaces and demonstrates that operators can maintain the necessary distance of antenna separation from the human body while normal operation.

Figure 3. Interfaces to connect Wireless options



The minimum antenna separation to satisfy the MPE limits (1mW/cm<sup>2</sup>), and the maximum power density at 20cm distance of each card are :

FCC ID	EIRP	Min. separation to satisfy the MPE limits *1	Max. power density at 20cm *2
<b>PI4BT-ULTRA</b>	1.4mW	0.34cm	$S_2 = 0.00028 \text{ mW/cm}^2$
<b>O2OBTPCM101</b>	2.7mW	0.47cm	$S_3 = 0.00054 \text{ mW/cm}^2$

$$*1 = \sqrt{\text{EIRP} / (1\text{mW/cm}^2 \times 4 \times \pi)}$$

$$*2 = \text{EIRP} / (4 \times 20\text{cm}^2 \times \pi)$$

When an operator will use the tree transmitters simultaneously during 30 minutes continuously in normal operation, the time-averaging exposure is :  $(S_1 + S_2 + S_3) \times 30 = 0.184$   
So the source-based time-averaging duty factor is considered as 100% duty.

Therefore the applying equipment meets the MPE requirements for general Population/  
Uncontrolled exposure.

### 3. RF Exposure Info of User's Manual :

The attachment in the next page is the RF exposure user's information described in the page 72 and 73 of the user's manual.

- The IEEE 802.11 Standard on Wireless LANs (Revision B), as defined and approved by the Institute of Electrical and Electronics Engineers.
- The Wireless Fidelity (WiFi) certification as defined by the WECA (Wireless Ethernet Compatibility Alliance).

## **Usage environment and your Health**

The Wireless LAN Mini-PCI Adapter emits radio frequency electromagnetic energy like other radio devices. However, the level of energy emitted is far less than the electromagnetic energy emitted by wireless devices like, for example, mobile phones.

Because the Wireless LAN Mini-PCI Adapter operates within the guidelines found in radio frequency safety standards and recommendations, IBM believes it is safe for use by consumers. These standards and recommendations reflect the consensus of the scientific community and the result from deliberations of panels and committees of scientists who continually review and interpret the extensive research literature. In some situations or environments, the use of the Wireless LAN Mini-PCI Adapter may be restricted by the proprietor of the building or responsible representatives of the organization. These situations may, for example, include:

- Using the Wireless LAN Mini-PCI Adapter on board airplanes, or
- In any other environment where the risk of interference to other devices or services is perceived or identified as harmful.

If you are uncertain of the policy that applies to the use of wireless devices in a specific organization (e.g. airport), you are encouraged to ask for authorization to use the Wireless LAN Mini-PCI Adapter prior to turning on the ThinkPad R30.

## **Wireless Regulatory information**

The ThinkPad R30 must be installed and used in strict accordance with the instructions as described hereafter. This product complies with the following radio frequency and safety standards.

### **USA - Federal Communications Commission (FCC)**

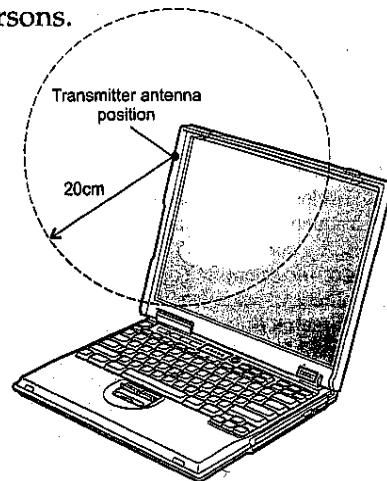
This product complies with FCC Part 15. The operation of the Wireless LAN Mini-PCI Adapter integrated in the product is subject to the following two conditions.

- It may not cause harmful interference.
- It accepts any interference that may cause undesired operation.

### **Exposure to Radio Frequency Radiation**

The radiated output power of the Wireless LAN Mini-PCI Adapter is far below the FCC radio frequency exposure limits. Nevertheless, the ThinkPad R30 shall be used in such a manner that the potential for human contact during normal operation is minimized as follows:

- **Caution:** To comply with FCC RF exposure compliance requirements, a separation distance of at least 20 cm (8 inches) must be maintained between the antenna of this device and all persons.



- In principle, the FCC certification does not permit the use of any other wireless PCMCIA card in your ThinkPad R30 in order to restrain the RF Exposure to the human body. However, some PCMCIA cards conform to the limit of the requirement and are admitted safe to use together with the Wireless LAN Mini-PCI Adapter in your ThinkPad notebook. Please visit IBM's web site for the latest certifications granted to check available wireless adapter options.

#### **Interference Statement**

An improper installation or unauthorized use may cause harmful interference to radio communications. Also, any tampering of the internal antenna will void the FCC certification and your warranty. Refer to "Electronic emission notices" on page 65 for more details.

#### **Canada – Industry Canada (IC)**

##### **Low Power License-Exempt Radiocommunication Devices (RSS-210)**

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

##### **Permis d'émission à faible puissance - Cas des appareils de communications radio (CNR-210)**

Le fonctionnement de ce type d'appareil est soumis aux deux conditions suivantes : (1) Cet appareil peut perturber les communications radio, et (2) cet